CLAIMS

What is claimed is:

1. A column for use in capillary electrochromatography comprising a tube, wherein said tube includes an inner surface having a charged, chemically-bonded stationary coating thereon.

2. The column according to claim 1, wherein said tube is defined as being made of materials selected from a group consisting of fused-silica, glass, titania, alumina, zirconia and polymeric hollow fibers with sol-gel active groups on the inner surface.

3. The column according to claim 2, wherein said coating is defined as a sol-gel polymer including a positively charged moiety and a chromatographic ligand.

4. The column according to claim 3, wherein said positively charged moiety is a positively charged strong base.

5. The column according to claim 3, wherein said positively charged moiety is selected from the group consisting of a quaternary amine, nitrogen, and strong inclusion complexes of cations within cavities of moieties bonded to the capillary surface.

6. The column according to claim 3, wherein said sol-gel polymer is formed from sol gel precursors with reactive sol-gel reactive groups selected from the group consisting of alkoxy groups and hydroxyl groups.

7. The column according to claim 3, wherein said sol-gel polymer includes a backbone having an inner metal selected from the group consisting of aluminum, titanium, silicon, zirconium, and vanadium.

8. The column according to claim 3, wherein said chromatographic ligand is selected from the group consisting of C_{18}, C_8, cyanopropyl, C_{12}, C_{30}, crown ether, and cyclodextran.

9. The column according to claim 3, wherein said sol-gel precursor is N-octadecyldimethyl[3-(trimethoxysilyl)propyl]ammonium chloride.

10. The column according to claim 2, wherein said coating is defined as a sol-gel polymer including a negatively charged moiety and a chromatographic ligand.

11. The column according to claim 10, wherein said negatively charged moiety is a negatively charged strong acid.

12. The column according to claim 10, wherein said negatively charged moiety is selected from the group consisting of sulfonic acid group and strong inclusion complexes of anions.

13. The column according to claim 10, wherein said sol-gel precursors are selected from the group consisting of alkoxy groups and hydroxyl groups.

14. A method of making a column for use in capillary electrochromatography, including a tube, wherein the tube includes an inner surface having a charged chemically-bonded stationary coating thereon, wherein the steps include filling the column with a sol-gel solution, maintaining the sol-gel solution

within the column, and forcing the sol-gel solution out of the column with an inert gas.

15. The method according to claim 14, further including hydrothermally treating the tube with deionized water.

16. The method according to claim 15, wherein said treating step further includes purging the inner surface of the tube with helium.

17. The method according to claim 14, wherein said filling step is further defined as filling the column with sol-gel precursor selected from a group consisting of N-octadecyldimethyl[3-(trimethoxysilyl)propyl]ammonium chloride, 3-mercaptopropyltrimethoxysilane, 3-mercaptopropyltriethoxysilane, mercaptomethylmethyldiethoxysilane, 3-mercaptopropylmethyldimethoxysilane, 3-mercaptopropyloctadecyldimethoxysilane, 3-mercaptopropylloctyldimethoxysilane, 3-mercaptopropylcyanopropyldimethoxysilane, and 3-mercaptopropyloctadecyldiethoxysilane

18. The method according to claim 14, wherein said maintaining step is further defined as maintaining the sol-gel solution within the column for a short residence time up to sixty minutes or more.

19. The method according to claim 14, wherein said forcing step is defined as expulsion of the sol-gel solution from the column with an inert gas selected from the group consisting of helium, nitrogen, neon, argon, and xenon.

20. A method of analytical separation with a column including an inner layer having a positively charged chemically-bonded stationary coating thereon by

reversing electroosmotic flow on the positively charged chemically-bonded stationary coating.

21. A method of using a column including an inner layer having a charge chemically-bonded stationary coating thereon by placing a solution within the column and reversing electroosmotic flow on the charged chemically-bonded stationary coating.

22. A method of analytical separation with a column including an inner layer having a negatively charged chemically-bonded stationary coating thereon by creating electroosmotic flow on the negatively charged chemically-bonded stationary coating.